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EG&G ISC GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2009
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CURED-IN-PLACE PIPE (CIPP) LINING

01/09

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SECTION 22 05 83.00 99

CURED-IN-PLACE PIPE (CIPP) LINING
01/09

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NOTE: This guide specification covers the requirements for cured-in-place pipe lining for facility interior piping systems.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification at ISC-ES.
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PART 1 GENERAL

1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you a31 a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API Spec 13A	(2006; Errata 2008) Specification for Drilling-Fluid Materials

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C950	(2007) Fiberglass Pressure Pipe

ASTM INTERNATIONAL (ASTM)

ASTM D 543	(2006) Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
ASTM D 638	(2008) Standard Test Method for Tensile Properties of Plastics
ASTM D 790	(2007e1) Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM F 1216	(2007) Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
ASTM F 1743	(2003) Standard Practice for Rehabilitation of Existing Pipeline and Conduits by Pulled-In-Place Installation of Cured-In-Place Thermosetting Resin Pipe (CIPP)

1.2 INTENT

It is the intent of this specification to provide for the repair and reconstruction of [roof drain leader piping from the roof to floor level] [_____] as identified in drawings.

1.3 GENERAL DESCRIPTION

Accomplish the reconstruction using a tube of one or more layers of flexible needle perforated felt or an equivalent non-woven perforated material, of specified length not to exceed 18.3 meters60 feet, and a thermo-set resin with physical and chemical properties appropriate for the application, in conformance with ASTM F 1216. Submit product data for epoxy resin, liner materials. Ensure all drilling fluids conform to API Spec 13A.

Provide a pressure impregnated tube liner with the resin then pulled into place and cured to form cured-in-place pipe (CIPP). Provide access to each end of the service line through an existing cleanout or by cutting into pipe.

1.4 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only a31 a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

CIPP liner equipment; [; G][; G, [_____]]
CIPP lining tube; [; G][; G, [_____]]
Pipe thermoset epoxy resin; [; G][; G, [_____]]

SD-08 Manufacturer's Instructions

Installation procedures for pipe lining; [; G][; G, [_____]]

SD-09 Manufacturer's Field Reports

Pipe Lining Installation Report; [; G][; G, [_____]]
Pipe Pre-Lining Inspection DVD and Report; [; G][; G, [_____]]
Pipe Post-Lining Inspection DVD and Report; [; G][; G, [_____]]

PART 2 PRODUCTS

2.1 PIPE LINING MATERIALS

2.1.1 CIPP Lining Tube

Provide a liner tube consisting of one or more layers of flexible needle perforated felt or an equivalent non-woven perforated material, continuous in length with uniform wall thickness. Overlapping sections are allowed in the length of the liner. Ensure that the liner tube is capable of conforming to 45 and 90 degree bends, offset joints, bells, and disfigured pipe sections.

Provide an integrated bladder within the felt tube that is made from materials compatible with the felt and resin systems used and capable of withstanding the required installation pressure.

Accomplish the CIPP liner installation remotely using cables to pull the product into place. Fill the bladder with air for curing. The cured-in-place pipe is to provide a smooth bore interior that conforms to the existing pipe and eliminates water leakage from the pipe to the exterior environment.

[Provide fiberglass pressure pipe conforming to AWWA C950.
]

2.1.2 Resin

Provide an epoxy resin impregnated, cured tube that is resistant to shrinkage, corrosion, oxidation, and is resistant to abrasion from solids, grit, sand in rainwater, and is solvent free. Use a resin with proven resistance to storm water and ultra-violet light (sunlight) at any stage prior to installation. Polyester or vinyl ester resins are not acceptable.

Ensure the proposed resin system does not contain silicones, stereates, and/or natural waxes that would adversely affect the adhesives properties or any other chemical or physical properties of the CIPP liner.

2.1.3 CIPP Properties

Provide CIPP with minimum chemical resistance requirements in accordance with ASTM D 543. Conduct exposure to the chemical solutions listed in Table 1 at temperatures of up to 23.9 degrees C75 degrees F. Conduct this test for a minimum period of one month. Loss result can not exceed 20 percent of the initial structural properties.

TABLE 1 - CHEMICAL RESISTANCE REQUIREMENTS

Chemical Solution Concentration	Percent
Tap Water (pH 6-9)	100.0
Nitric Acid	5.0
Phosphoric Acid	10.0
Sulfuric Acid	10.0
Gasoline	100.0
Vegetable Oil	100.0
Detergent or Soap	0.1

Ensure the CIPP meets the minimum structural properties listed in Table 2 below:

TABLE 2 - CIPP INITIAL STRUCTURAL PROPERTIES - ASTM F 1743

Property	ASTM Test Method	Minimum Value
Tensile Strength	ASTM D 638	20684 kilopascal3,000 psi
Flexural Strength	ASTM D 790	31026 kilopascal4,500 psi
Short Term Flexural Modulus of Elasticity	ASTM D 790	1724 megapascal250,000 psi

Provide a cured liner with a light blue reflective internal wall color so that a clear detail CCTV inspection can be accomplished.

PART 3 EXECUTION

3.1 INSTALLATION PROCEDURE

Install in accordance with ASTM F 1743.

3.1.1 General

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NOTE: Use the first paragraph for roof drains only.
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[Inform the [Contracting Officer] [Contract Administrator] of temporary roof drain flow stoppage, for a typical period of 2 to 3 days. Provide by-pass of the collector pipe.]

For access at the bottom of the pipe sections, remove pipe sections near the floor at the appropriate point on the vertical rain leader in accordance with the design drawings.

3.1.2 Pipe Preparation

CCTV inspect the line and determine the overall condition of the pipe prior to starting the Pre-conditioning of the pipe.

Perform pre-conditioning of the pipe section, including preparatory cleaning, corrosion removal, removal of grease buildup, or any other obstruction that may interfere with lining operations.

Leave obstructions that are less than 15 percent of the pipe diameter, that can not be removed from the pipe, in place and line over.

CCTV inspect the line immediately prior to lining and after the cleaning is complete to ensure that the pipe is ready for lining.

3.1.3 CIPP Installation Procedure

3.1.3.1 Wet Out

Accurately calculate and measure the amount of resin and catalyst required. Thoroughly mix the resin and catalyst. Thoroughly saturate/impregnate the flexible felt tube with the pre-calculated amount of epoxy resin prior to installation. Handle the resin impregnated flexible tube to retard or prevent resin setting until it is ready for insertion.

3.1.3.2 Insertion

Install the liner/bladder system using the pull in place method. Pull the liner/bladder system to the specified location in the pipe. Inflate the bladder using compressed air to a pressure adequate to form the liner to tightly fit the internal circumference of the pipe and to cause the resin to migrate into pipe joints, voids and defects. Install the liner at low pressure (not to exceed 69 kilopascal10 psi) to prevent initial or further damage to the host pipe.

3.1.3.3 Curing

Inflate the bladder using compressed air and leave the liner in place until the resin curing cycle is complete, until the cure is complete. Curing occurs at ambient temperature within one hour.

When the curing process is complete, release the pressure and pull out the inflation bladder. The cured composite liner is to remain in place within the host pipe. Ensure the cured-in-place pipe provides a smooth bore interior and conforms to the existing pipe[, eliminating rain water leakage]. Ensure the tube is continuous in length, wall thickness, and is uniform. Reline any existing defects in the original pipe.

3.1.3.4 Finish

No barriers, coatings, or any material other than the cured liner tube/resin composite, specifically designed for desirable physical and chemical resistance properties, is to be left in the host pipe. Any materials used in the installation, other than the cured liner tube/resin composite, are to be removed from the pipe. Remove any cured liner tube/resin composite pipe left protruding from the service connection. Ensure that the finished CIPP is continuous and free from visual defects such as foreign inclusions, dry spots, pinholes, and delimitation.

3.1.4 Liner Inspection

Perform a final Digital Video Disc (DVD) inspection to verify proper cure and integrity of the composite liner. Submit a DVD recording of the finished work and written documentation pertaining to the pipe lining installation.

3.2 DEVIATIONS

Should pre-installation inspection reveal conditions in the rain leader to be substantially different than those used in the design of wall thickness, liner tube construction, liner tube length, or resin system; notify the [Contracting Officer][Contract Administrator] and provide a videotape recording of existing conditions and design data. Do not proceed without

direction from [Contracting Officer] [Contract Administrator].

3.3 CLEAN-UP

After liner installation has been completed and accepted, clean the entire project area and restore the site to its original condition prior to the commencement of work. Dispose of all excess material and debris not incorporated into the permanent installation.

3.4 FINAL ACCEPTANCE

Upon completion, submit the DVD records of pre-lining inspection and post-lining inspection, along with the written report summarizing the extent of pipe lining performed. Update pipe lining contract record drawings to reflect the as-built condition after lining is complete and submit to the [Contracting Officer] [Contract Administrator]. The [Contracting Officer] [Contract Administrator] may review the video and documentation, and may inspect the work site to determine that the scope of work is complete, that the work is satisfactory, and the site has been returned to its original condition.

-- End of Section --